

**APPLICATION OF ANADARKO PETROLEUM CORP. FOR AUTHORIZATION
PURSUANT TO STATEWIDE RULE 36 TO INJECT FLUIDS CONTAINING HYDROGEN
SULFIDE ON THE BOYD LEASE IN THE SLAUGHTER FIELD, COCHRAN COUNTY,
TEXAS**

HEARD BY: Donna K. Chandler

DATE OF HEARING: May 25, 2000

APPEARANCES:

Philip Patman
C. M. Stephens, Jr.
Dennis Cowan
Robert M. Gray
Douglas Dietrich

John Soule

REPRESENTING:

Anadarko Petroleum Corp.

Occidental Permian

EXAMINER'S REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

Anadarko Petroleum Corp. requests authority pursuant to Statewide Rule 36 to inject fluids containing hydrogen sulfide in 15 wells on the Boyd lease in the Slaughter Field in Cochran County. Anadarko has made separate application with Environmental Services for authority pursuant to Rule 46.

This application was unopposed and the examiner recommends approval.

DISCUSSION OF THE EVIDENCE

The Slaughter Field was discovered in 1937 and was initially developed in the 1940's. Waterflooding in the field commenced in the 1960's and tertiary recovery by injection of carbon dioxide (CO₂) began in the 1980's.

The first well on the 1,240 acre Boyd lease was drilled in 1940 and secondary recovery by waterflooding was initiated on the lease in 1958. There are 33 producing wells and 24 water injection wells on the lease. Current production is 300 BOPD, 150 MCFD and 10,000 BWPD.

Anadarko took over operations of the lease in 1992 and plans to initiate a tertiary CO₂ flood on the lease, alternating water and gas production (WAG). Currently, the produced gas from the lease is purchased by Occidental Permian for processing at its Slaughter Gas Processing Plant. Anadarko expects that CO₂ will break through soon after injection operations begin and Occidental will not take the gas containing CO₂. At that time, Anadarko will begin re-injecting the produced gas on the lease. Anadarko will use 15 wells for injection of produced gas containing CO₂, hydrogen sulfide, and hydrocarbon gas. The other nine injection wells on the lease will be used for injection of CO₂ only. The nine wells are in close proximity to Girlstown USA, a boarding school for teenage girls. The Girlstown complex occupies approximately 100 acres within the confines of the Boyd lease and the entire surface acreage of the Boyd lease is owned by Girlstown. The 15 wells which will inject hydrogen sulfide gas are further removed from Girlstown than the other nine wells.

The Boyd lease is adjacent to several ongoing CO₂ floods. Based on the performance of the existing projects, Anadarko estimates that the tertiary project will result in the recovery of an additional 7.5 million BO, or approximately 15% of original oil in place beneath the unit. Primary and secondary recovery on the lease is expected to be 24.5 million BO, or 50% of original oil in place. Cumulative production to date is 18.5 million BO.

The 500 part per million (ppm) radius of exposure (ROE) for the 15 injection wells and the lines which will carry hydrogen sulfide gas do not include any portion of the Girlstown complex. However, the 500 ppm ROE for two wells, the No. 4 and No. 7, does include small portions of Hwy. 301. The 100 ppm ROE for two wells, the No. 27 and No. 46, includes a small portion of the Girlstown complex. The 100 ppm ROE for a section of the injection distribution line also includes a small portion of Girlstown. In addition, portions of Hwy. 301 are within the 100 ppm ROE of injection well Nos. 4, 7, and 54 and a section of the injection distribution line. Portions of Hwy. 1585 are within the 100 ppm ROE for Nos. 20 and 56. These calculations assume worst case scenarios, including full pipe shear of the wellbore or total pipe failure of the distribution system, and a hydrogen sulfide concentration of the injected gas stream of 10,000 ppm. The Commission's District Office has approved Form H-9 (Certificate of Compliance Statewide Rule 36) and the Contingency Plan submitted by Anadarko.

Anadarko has designed the injection project with the highest regard for safety due to the proximity of the lease to public roads and Girlstown. The entire system was designed based upon API 14C (Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Safety Systems for Offshore Production Platforms). This provides additional safety as is required on offshore platforms which have personnel in constant close proximity to hazardous situations.

The injection distribution system is designed to meet all requirements of Rule 36 (c)(6)(C)(i) and ASME B31.8 code for "Gas Transmission and Distribution Piping Systems". Control and safety equipment has been installed pursuant to Rule 36(c)(8). Pressures will be continuously monitored

to trigger automatic shut down of the system at high or low pressure conditions. Pressure transmitters, block valves and check valves will be placed throughout the injection distribution system at each valve station, with shutdown valves at each valve station. Rate and pressure information will be continuously monitored at each injection well. If pressure deviates from a given range, alarms will notify appropriate personnel.

The entire lease will be fenced as well as the area around the Girlstown complex. In addition, all injection and producing wells within 1/4 mile of any building within the Girlstown complex or public roads that border the lease will be fenced, and locked if unattended. Warning signs will be posted along all roads that lead to surface facilities and public areas within the exposure area. Warning signs will also be posted at all surface facilities where the potential exists for release of hydrogen sulfide gas. The lease will be manned by Anadarko personnel 24 hours a day

Automatic hydrogen sulfide and carbon dioxide gas detection equipment will be installed at each public area including the Girlstown complex and along the public roadways that border the lease. In addition, a hydrogen sulfide detection device will be installed in the pure CO₂ system to detect any slight hydrogen sulfide which may be in the gas injected into the nine wells around the Girlstown complex.

All Anadarko personnel receive hydrogen sulfide safety training on a yearly basis and all contract personnel who work on Anadarko leases must also have hydrogen sulfide safety training. The staff and residents of Girlstown USA will also be given annual training on hydrogen sulfide and the safety and warning systems in place.

FINDINGS OF FACT

1. Notice of this hearing was given to all persons entitled to notice at least ten (10) days prior to the subject hearing.
2. The Slaughter Field was discovered in 1937. There are numerous tertiary recovery projects in the field which are similar to that proposed by Anadarko for the Boyd lease.
3. The Boyd lease has been under secondary recovery by waterflooding since 1958 and current production is 330 BOPD, 150 MCFD and 10,000 BWPD.
4. The Boyd lease contains 1,240 acres. Girlstown USA, a boarding school for teenage girls, owns the entire surface acreage and has a campus complex which covers approximately 100 acres of the lease.
5. The produced gas from the lease is currently purchased by Occidental Permian for processing at the Slaughter Gas Processing Plant.

6. The proposed tertiary recovery project will consist of injection of CO₂ and water. After breakthrough of the CO₂, the produced gas will no longer be accepted by Occidental for processing and Anadarko will reinject the produced gas, which contains hydrogen sulfide, hydrocarbon gas and CO₂.
7. The produced gas will be reinjected into 15 wells on the Boyd lease, the Nos. 2, 4, 7, 14, 16, 18, 20, 27, 28, 45, 46, 51, 52 and 56. Nine other injection wells on the lease which are closer to the Girlstown complex, will inject CO₂ with no hydrogen sulfide gas.
8. The 500 ppm ROE for the 15 injection wells and the distribution lines carrying hydrogen sulfide gas do not include any portion of the 100 acre Girlstown complex. The 500 PPM ROE for two wells, No. 24 and No. 27, does include portions of Hwy. 301.
9. The 100 ppm ROE for two wells, No. 27 and No. 46, and a portion of the distribution line, includes a small portions of the Girlstown complex. The 100 ppm ROE for Nos. 20 and 56 includes a portion of Hwy 1585. The 100 ppm ROE for Nos. 4, 7 and 54 and a portion of the distribution line includes a portion of Hwy. 301.
10. The radii of exposure are calculated based on worst case scenarios with maximum escape volumes and hydrogen sulfide concentrations.
11. The proposed injection meets the safety requirements of Rule 36 regarding warning and marker provisions, security provisions and materials and equipment.
12. The Commission's District Office has approved the Certificate of Compliance and contingency plan for this project.

CONCLUSIONS OF LAW

1. Proper notice was timely given to all parties entitled to noticed pursuant to applicable statutes and rules.
2. All things have occurred and have been accomplished to give the Commission jurisdiction in this case.
3. Anadarko Petroleum Corp. has complied with the safety provisions of Statewide Rule 36 for injection of fluid containing hydrogen sulfide.

EXAMINER'S RECOMMENDATION

The examiner recommends approval of the application of Anadarko Petroleum Corp. to inject fluid containing hydrogen sulfide into 15 wells on the Boyd lease in the Slaughter Field in Cochran County.

Respectfully submitted,

Donna K. Chandler
Technical Examiner